Chapter 3 - Environmental Program Information

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Chapter Highlights

There are many environmental monitoring programs that help implement the Environmental Compliance Policy for the Idaho National Engineering and Environmental Laboratory (INEEL). Most of the regulatory compliance activity is performed through various environmental monitoring programs, the recently signed Accelerated Cleanup Agreement, the Environmental Restoration Program, and the Waste Management Program.

The major objectives of the various environmental monitoring programs conducted at the INEEL are to identify the key contaminants released to the environment, to evaluate different pathways through which contaminants move in the environment, and to determine the potential effects of these contaminants on the public and the environment. The various environmental monitoring programs are also used to detect, characterize, and report unplanned releases; evaluate the effectiveness of effluent treatment, control, and pollution abatement programs; and determine compliance with other U.S. Department of Energy (DOE) commitments.

During 2003, responsibility for environmental monitoring onsite was with the prime Management and Operating contractor at the INEEL, Bechtel BWXT Idaho, LLC. The offsite environmental monitoring program was the responsibility of the Environmental Surveillance, Education and Research Program contractor who, during 2003, was a team led by the S. M. Stoller Corporation.

Environmental media sampled under these programs include ambient air; drinking, surface, and ground water; soils; vegetation; agricultural products; wildlife; and direct radiation. Samples are analyzed for a wide array of constituents ranging from pH, inorganics, volatile organics, gases, and gross alpha and beta activity to specific radionuclides, such as tritium, strontium-90, and plutonium isotopes.

In May 2002, DOE, the Idaho Department of Environmental Quality and the U.S. Environmental Protection Agency signed a letter of intent formalizing an agreement to pursue accelerated risk reduction and cleanup at the INEEL. The intent of accelerating the cleanup of the INEEL yields two significant objectives: (1) risk reduction and continued protection of the Snake River Plain Aquifer, and (2) consolidation of Environmental Management activities and reinvestment of savings into

cleanup. Nine strategic initiatives were developed around these two objectives to accelerate cleanup. Significant progress was made during 2003.

Since the Federal Facility Agreement and Consent Order was signed in December 1991: 22 Records of Decision have been signed and are being implemented; three Remedial Investigation/Feasibility Studies are under development; and more than 70 percent of Comprehensive Environmental Response, Compensation, and Liability Act actions have been completed. Only three investigations remain to be completed:

- Buried waste at the Radioactive Waste Management Complex Waste Area Group-7 (WAG 7);
- Soil contamination at the Idaho Nuclear Technology and Engineering Center (INTEC) Tank Farm (WAG 3, Operable Unit [OU] 3-14);
- Snake River Plain Aquifer contamination (WAG 10, Operable Unit 10-8).

A review of all CERCLA remediations completed under the WAG 2 Record of Decision was completed in 2003. It was determined that all requirements have been met and all identified FFA/CO-enforceable milestones related to the WAG 2 ROD have been completed. This is the first WAG at the INEEL to be closed out and prepared to transition into Long-Term Stewardship management.

Under the accelerated cleanup agreement, planning is underway to determine the end state and to work toward closure of many contaminated areas and buildings at the INEEL.

The overall goals of the Waste Management Program are to ensure that workers and the public are protected and the environment is not further impacted. The Waste Management Program provided presentations to the INEEL Citizens Advisory Board to explain issues related to the program. Stakeholders were also notified of the timeframes for regulatory-required public comment periods and where documents could be found for their review and participated in several tours of the INEEL that featured the mission and accomplishments of the Waste Management Program.

The Federal Facility Compliance Act requires the preparation of a site treatment plan for the treatment of mixed wastes (those containing both radioactive and nonradioactive hazardous materials) at the INEEL. During 2003, five site treatment plan milestones were met.

The overall goal of the Advanced Mixed Waste Treatment Project is the treatment of alpha-containing low-level mixed and transuranic wastes for final disposal. A contract for treatment services was awarded to British Nuclear Fuels Limited, Inc. in December 1996. They completed construction of the facility in December 2002 and commenced retrieval operations in March 2003.

As of 2003, six 1.14 million liter (300,000 gallon) underground tanks in the INTEC Tank Farm have been emptied and one of the tanks has been cleaned to State-approved standards. This leaves only five of these initial six tanks to be emptied.

Significant accomplishments were achieved during 2003 in the disposal of low-level and mixed waste stored and generated at the INEEL. Activities were highlighted by the treatment and disposal of over 900 m^3 (1177 yd^3) of mixed low-level waste. Approximately 4000 m^3 (5232 yd^3) of legacy and newly generated low-level waste was disposed at the Subsurface Disposal Area in 2003.

The Transuranic Waste Program continued transuranic waste shipments to the Waste Isolation Pilot Plant. A total of 384 m^3 (502 yd^3) were shipped in 2003.

The INEEL Management and Operating contractor continued to make progress on the effort initiated in 1997 to develop and implement an INEEL-wide Environmental Management System. The Environmental Management System meets the requirements of International Standards Organization (ISO) 14001. The INEEL EMS received ISO 14001 registration in June 2002. A semi-annual ISO 14001 surveillance performed in November 2003, found no nonconformances with the ISO standard.

All 62 spent nuclear fuel storage racks, the coffins, the transfer cart adapter, and miscellaneous equipment that had been in wet storage at Test Area North was transferred to dry storage at Test Area North's spent nuclear fuel storage pad in 2003. Power Burst Facility fuels were transferred to the Irradiated Fuel Storage Facility in 2003.

The INEEL Citizens Advisory Board was formed in March 1994. During its tenure, the Citizens Advisory Board has produced recommendations on over 100 topics. In 2003, the Board provided recommendations on seven critical topics.

ENVIRONMENTAL PROGRAM INFORMATION

This chapter highlights the Idaho National Engineering and Environmental Laboratory (INEEL) environmental programs that help implement the Environmental Policy for the INEEL (see front matter of this report). Much of the regulatory compliance activity is performed through the various environmental monitoring programs (Section 3.1), the recently signed Accelerated Cleanup Agreement (Section 3.2), Environmental Restoration (Section 3.3), INEEL Long-Term Stewardship Program (Section 3.4), Waste Management (Section 3.5), and Environmental Management System (Section 3.6). Section 3.7 summarizes other significant INEEL environmental programs and activities.

3.1 Environmental Monitoring Programs

Environmental monitoring consists of two separate activities: effluent monitoring and environmental surveillance. Effluent monitoring is the measurement of constituents within a waste stream before its release to the environment, such as the monitoring of stacks or discharge pipes. Environmental surveillance is the measurement of contaminants in the environment. Surveillance involves determining whether or not contaminants are present or measurable in environmental media and, if present, in what concentrations they are found.

Effluent monitoring is conducted by various INEEL organizations. Airborne effluent measurements and estimates, required under the Idaho State Implementation Plan, are the responsibility of the regulated facilities. At the INEEL, these facilities include Argonne National Laboratory-West (ANL-W), Central Facilities Area (CFA), Idaho Nuclear Technology and Engineering Center (INTEC), Naval Reactors Facility (NRF), Power Burst Facility/Critical Infrastructure Test Range (PBF/CITR), Radioactive Waste Management Complex (RWMC), Test Area North/Specific Manufacturing Capability (TAN/SMC), and Test Reactor Area (TRA). Descriptions of the airborne effluent monitoring programs are beyond the scope of this document and are not discussed. The Liquid Effluent Monitoring Program and Storm Water Monitoring Program, conducted by the Management and Operating (M&O) contractor, are designed to demonstrate compliance with the Clean Water Act, Wastewater Land Application Permits, and other associated permits.

Environmental surveillance is the major environmental monitoring activity conducted at the INEEL. As such, much of this report concentrates on this task. The remainder of this section summarizes environmental monitoring program objectives; the history of environmental monitoring at the INEEL; and information on monitoring of specific environmental media (air, water, agricultural products, animal tissue, and soil), direct radiation, and meteorology.

Results of the environmental monitoring programs for 2003 and additional information on major programs can be found in Chapter 4 (air), Chapter 5 (compliance monitoring of water), Chapter 6 (surface and groundwater), and Chapter 7 (agricultural, wildlife, soil, and direct radiation). Chapter 9 presents 2003 results on current ecological research programs at the INEEL.

Objectives of Environmental Monitoring

Operations of INEEL facilities have the potential to release materials, which may include both radioactive and nonradioactive contaminants, into the environment. These materials can enter the environment through two primary routes: into the atmosphere as airborne effluents and into surface water and groundwater as liquid effluents or storm water runoff. Through a variety of exposure pathways (Figure 3-1), contaminants can be transported away from INEEL facilities, where they could potentially impact the surrounding environment and the population living in these areas.

The major objectives of the various environmental monitoring programs conducted at the INEEL are to identify the key pollutants released to the environment, to evaluate different pathways through which pollutants move in the environment, and to determine the potential effects of these pollutants on the public and on the environment.

As discussed previously, monitoring also provides the information to verify compliance with a variety of applicable environmental protection laws, regulations, and permits described in Chapter 2. The establishment and conduct of an environmental monitoring program at the INEEL is required by the U.S. Department of Energy (DOE) Order 5400.1 (DOE 1993). In January 2003 a new DOE order was established to cover environmental monitoring. DOE Order 450.1 was less prescriptive than the previous Order 5400.1 and created the requirement for DOE and contractor organizations to establish an Environmental Monitoring System (EMS). DOE is in the process of finalizing guidance on what constitutes a complete EMS, but many of the same components of Order 5400.1 remain (i.e., regular monitoring on environmental media).

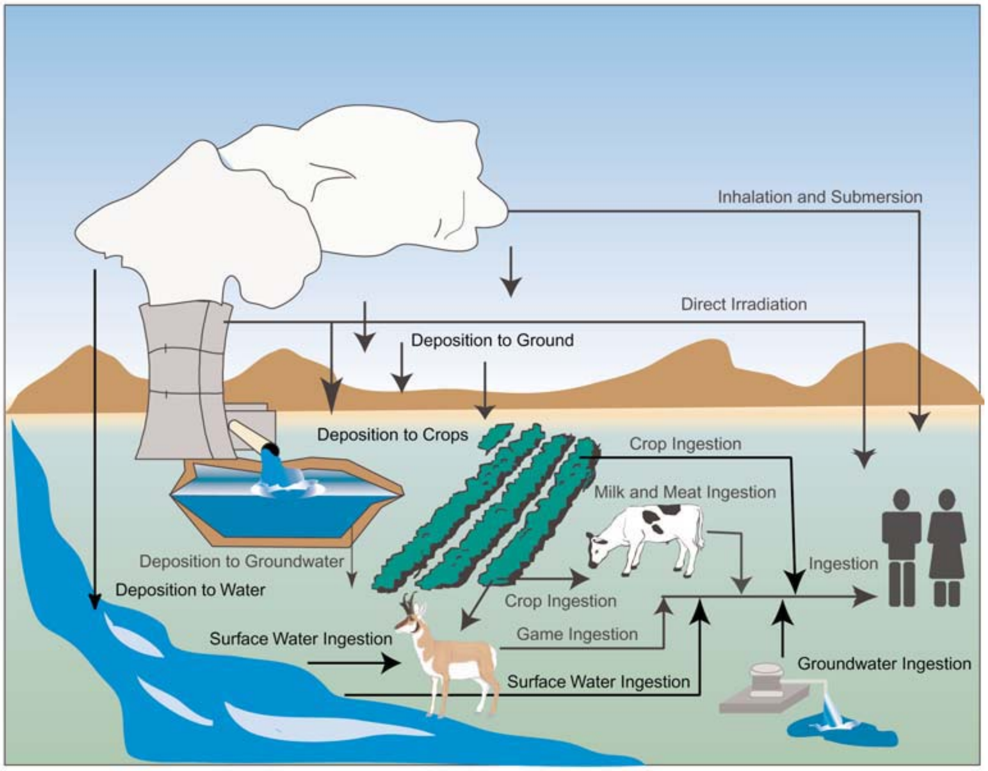

Figure 3-1. Potential exposure pathways to humans from the INEEL.

The various environmental monitoring programs are also used to detect, characterize, and report unplanned releases; evaluate the effectiveness of effluent treatment, control, and pollution abatement programs; and determine compliance with commitments made in environmental impact statements, environmental assessments, safety analysis reports, or other official DOE documents.

History of Environmental Monitoring

Environmental monitoring has been performed at the INEEL by DOE and its predecessors, the Atomic Energy Commission and Energy Research and Development Agency, as well as by other federal agencies, various contractors, and State agencies since its inception in 1949.

The organization of environmental monitoring programs has remained fairly constant throughout much of the history of the INEEL. The Atomic Energy Commission's Health Services Laboratory, later named the DOE's Radiological and Environmental Sciences Laboratory (RESL), was responsible for conducting most environmental surveillance tasks from the early 1950s to 1993 both on and off the INEEL Site. Contractors operating the various facilities were responsible for monitoring activities performed within the facility boundaries and for effluent monitoring.

Early monitoring activities focused on evaluating the potential of exposing the general public to a release of radioactive materials from INEEL facilities. Radionuclides were the major contaminants of concern because the INEEL was heavily involved in testing nuclear facilities.

DOE and its predecessor agencies sampled and analyzed environmental media that could be affected by atmospheric releases. During those early years, the various M&O contractors conducted sampling of liquid and airborne effluents from facilities to develop waste inventory information.

Throughout the history of the Site, the U.S. Geological Survey (USGS) has monitored groundwater quantity and quality in the Snake River Plain Aquifer, with emphasis on the portion of the aquifer beneath the INEEL. The National Oceanic and Atmospheric Administration (NOAA) has also monitored weather conditions at the INEEL since the Site's inception.

As a result of a large scale, comprehensive site audit in 1993, the DOE environmental monitoring program was divided into separate onsite and offsite programs. Responsibility for the onsite program was transferred to the M&O contractor. During 2003, Bechtel BWXT Idaho, LLC (BBWI) was the prime M&O contractor at the INEEL. The offsite monitoring program was transferred to the Environmental Surveillance, Education and Research Program (ESER) contractor. During 2003, the ESER contractor and offsite monitoring activities were performed by a team led by the S. M. Stoller Corporation.

Air Monitoring

Historical Background - Low-volume air samplers have been operated on and in the vicinity of the INEEL since 1952. Table 3-1 lists the areas where samplers have been located and the dates of operation for these samplers (derived from DOE-ID 1991). Before 1960, radiation detection devices, such as a Geiger-Müller tube, were used to record the amount of radioactivity on the filters. Gross beta measurements were made starting in 1960, and by 1967 the present series of analytical measurements were being performed.

High-volume air samplers were operated at the Experimental Field Station (EFS) and CFA from 1973 until October 1996. In 1996, a program evaluation determined that the cost of operating the high-volume samplers was not commensurate with the data being collected, and operations were suspended. Also in 1973, a high-volume sampler began operation in Idaho Falls as part of the U.S. Environmental Protection Agency's (EPA's) nationwide Environmental Radiation Ambient Monitoring System.

Tritium in atmospheric moisture has been measured at a minimum of two locations since at least 1973. Some limited monitoring may have been performed before this time.

One monitoring location at CFA collected samples of noble gases, with specific interest in krypton-85 (^{85}Kr) from approximately 1984 until 1992. This station was used to monitor releases of ^{85}Kr from the INTEC during periods when fuel reprocessing was taking place.

Nitrogen dioxide and sulfur dioxide were first monitored for a nine-week period at five onsite locations in 1972. A nitrogen dioxide sampling station operated from 1983 to 1985 to monitor waste calcining operations at INTEC. A sulfur dioxide sampler was also used from 1984 to 1985. The two sampling locations were reactivated in 1988 for nitrogen dioxide, and one station operated from 1989 through 2001 for sulfur dioxide.

Table 3-1. Historical low volume radiological air sampling locations and dates of operations.

Sampling Location	Dates of Operation
Distant Locations	
Aberdeen	1952–1957, 1960–1970
American Falls	1970
Blackfoot	1968–2001
Blackfoot Community Monitoring Station	1983–present
Carey	1961–1970
Craters of the Moon[a]	1973–present
Dubois	2001–present
Dietrich	1961–1970
Idaho Falls	1953–1955, 1956–present
Jackson	2001–present
Minidoka	1961–1970
Pocatello	1969–1980
Rexburg Community Monitoring Station	1983–present
Spencer	1953–1956
Boundary Locations	
Arco	1968–present
Atomic City	1953–1957, 1960–1970, 1973–present
Butte City	1953–1957, 1960–1973
Blue Dome	2001–present
Federal Aviation Administration Tower	1981–present
Howe	1958–present
Monteview	1958–present
Mud Lake	1958–present
Reno Ranch/Birch Creek	1958–2001
Roberts	1960–1970
Terreton	1953–1956, 1964–1965
INEEL Locations	
Argonne National Laboratory-West	1961–present
Aircraft Nuclear Propulsion Program	1953–1955, 1961–1963
Auxiliary Reactor Area	1966–present
Central Facilities Area	1953–present
East Butte	1953–1955
Experimental Breeder Reactor No. I	1952–1956, 1958–present
Experimental Field Station	1972–present
Fire Station #2	1958–1963
Gas-Cooled Reactor Experiment	1961–1963
Idaho Nuclear Technology and Engineering Center	1953–1956, 1958–1970, 1981–present
Main Gate	1976–present
Mobile Low Power Reactor No. I	1961–1963
Naval Reactors Facility	1956, 1958–present
Organic Moderated Reactor Experiment	1957–1963
Power Burst Facility	1958–present
Radioactive Waste Management Complex	1973–present
Rest Area, Highway 20	2000–present
Stationary Low-Power Reactor No. I	1961–1963
Test Area North	1953–1955, 1956–present
Test Reactor Area	1953–1956, 1958–present
Van Buren Gate	1976–present

a. Designated as a boundary location 1973–1981.

The National Park Service, in cooperation with other federal land management agencies, began the Interagency Monitoring of Protected Visual Environments (IMPROVE) program in 1985. This program was an extension of an earlier EPA program to measure fine particles of less than 2.5 µm in diameter ($PM_{2.5}$). These particles are the largest cause of degraded visibility. In May 1992, one IMPROVE sampler was established at CFA on the INEEL and a second was located at Craters of the Moon National Monument as part of the nationwide network. Each of the two samplers collected two 24-hour $PM_{2.5}$ samples a week. Analyses were performed for particulate mass, optical absorption, hydrogen, carbon, nitrogen, oxygen and the common elements from sodium through lead on the periodic table. Operation of the CFA sampler ceased in May 2000 when the EPA removed it from the nationwide network.

Current Programs - Both the ESER and M&O contractors maintain a network of low-volume air samplers to monitor for airborne radioactivity (Figure 3-2). The ESER contractor operates 12 samplers at offsite locations and three onsite samplers. The ESER contractor added a thirteenth offsite sampler in June 2001 at Jackson, Wyoming. Two samplers were also moved to new locations in July 2001 when the landlords terminated the leases at the previous stations. The sampler at Blackfoot was moved to Dubois and the sampler at Reno Ranch/Birch Creek was moved to Blue Dome. The M&O contractor maintains 13 onsite and four offsite sampling locations.

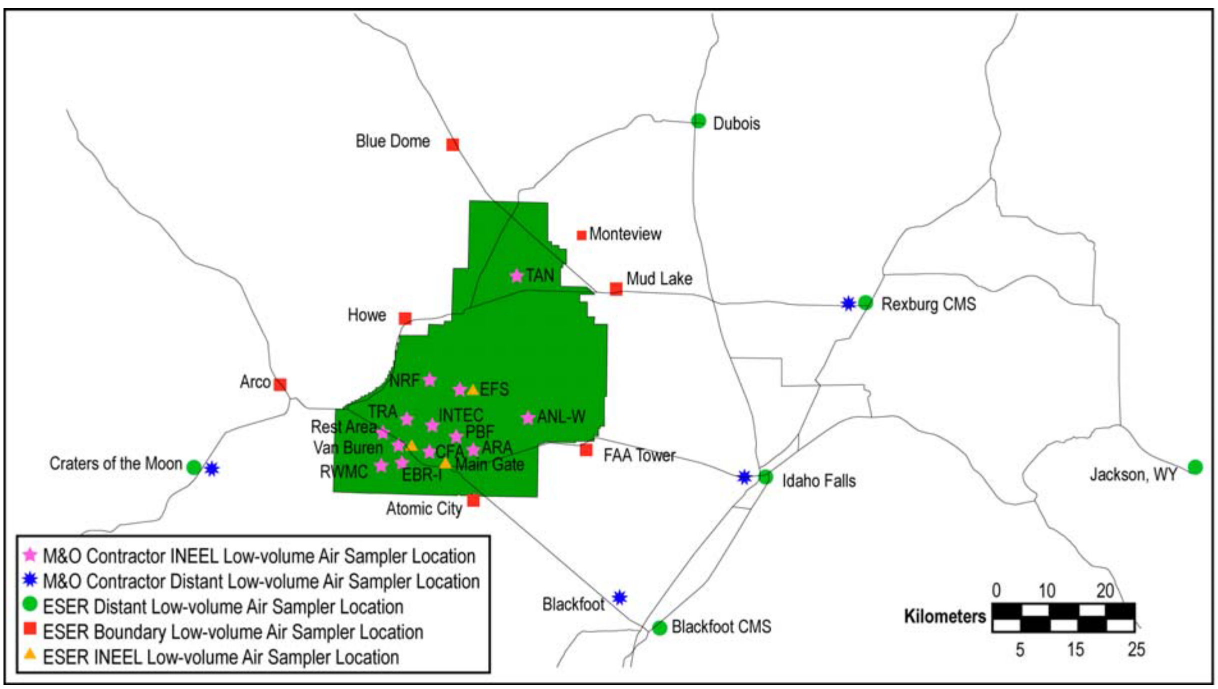

Figure 3-2. ESER and M&O contractor low-volume radiological air sampling locations.

Each low-volume air sampler maintains an average airflow of 50 L/min (2 ft^3/min) through a set of filters consisting of a 1.2 µm pore membrane filter followed by a charcoal cartridge. The membrane filters are 99 percent efficient for airborne particulates with an aerodynamic diameter of 0.32 µm, and higher for larger diameter particulates.

Filters from the low-volume air samplers are collected and analyzed weekly. Charcoal cartridges are analyzed for iodine-131 (^{131}I) either individually or in batches of up to nine cartridges. During batch counting, if any activity is noted in a batch, each cartridge in that batch is recounted individually.

Particulate filters are analyzed weekly using a proportional counting system. Filters are analyzed after waiting a minimum of four days to allow naturally occurring radon progeny to decay. Gross alpha and beta analyses are used as a screening technique to provide timely information on levels of radioactivity in the environment.

Specific radionuclide analyses are more sensitive than gross alpha and gross beta analyses for detecting concentrations of anthropogenic (human-made) radionuclides in air. The particulate filters of the low-volume samplers are composited by location at the end of each quarter, and all composites are analyzed for specific radionuclides by gamma spectrometry. Composites are then submitted for analyses for specific transuranic radionuclides (americium-241 [^{241}Am], plutonium-238 [^{238}Pu], plutonium-239/240 [$^{239/240}$Pu]), and strontium-90 (^{90}Sr).

Measurements of suspended particulates are also performed on the 1.2-µm pore membrane filters from the low-volume air samplers. The M&O contractor weighs their filters weekly before and after sampling to determine the amount of material collected. The ESER contractor also weighs the filters weekly before and after use. In both cases, the amount of material collected is determined by subtracting the presampling (clean filter) weight from the postsampling (used filter) weight. The concentration of suspended particulates is calculated by dividing the amount of material collected on the filters by the total volume of air that passed through the filters.

Samplers for tritium in atmospheric moisture are located at two onsite and four offsite locations. In these samplers, air is pulled through a column of desiccant material (i.e., silica gel or molecular sieve) at 0.3-0.5 L/hr (0.6-1.0 ft^3/hr). The material in the column absorbs water vapor. Columns are changed when sufficient moisture to obtain a sample is absorbed (typically from one to three times per quarter). The absorbed water is removed from the desiccant through heat distillation. Tritium concentrations in air are then determined from the absorbed water (distillate) by liquid scintillation counting. Atmospheric concentrations in air are determined from the tritium concentration in the distillate, quantity of moisture collected, and the volume of air sampled.

Tritium is also monitored using precipitation samples collected on the INEEL monthly at CFA and weekly at the EFS. A monthly sample is also obtained offsite in Idaho Falls. Each precipitation sample is submitted for tritium analysis by liquid scintillation counting.

Nitrogen oxides was monitored at the two stations on the INEEL (Van Buren Gate and EFS) through June 2003. Sulfur dioxide is no longer monitored at the one station (Van Buren Gate). Both these samplers have been placed on stand-by as the INEEL no longer releases either of these constituents. The IMPROVE sampler station at Craters of the Moon continued operation through 2003.

Water Monitoring

Historical Background - The USGS has conducted groundwater studies at the INEEL since the Site's inception in 1949. The USGS was initially assigned the task to characterize water resources of the area. It has since maintained a groundwater quality and water level measurement program on the INEEL to support research and monitor the movement of radioactive and chemical constituents in the Snake River Plain Aquifer. The first well, USGS 1, was completed and monitored in December 1949. USGS personnel have maintained an INEEL Project Office at CFA since 1958 (USGS 1998).

In 1993, the DOE Idaho Operations Office (DOE-ID) initiated a program to integrate all of the various groundwater monitoring programs on the INEEL. This resulted in the development of the *INEL Groundwater Monitoring Plan* (DOE-ID 1993a) and the *INEL Groundwater Protection Management Plan* (DOE-ID 1993b). The monitoring plan described historical conditions and monitoring programs, and it included an implementation plan for each facility. The protection management plan established policy and identified programmatic requirements.

Sampling and analysis of drinking water both onsite and offsite began in 1958. Analysis for tritium began in 1961. Up to 28 locations were sampled before increased knowledge of the movement of groundwater beneath the INEEL led to a decrease in the number of sampling locations. In 1988, a centralized drinking water program was established. Each contractor participates in the INEEL Drinking Water Program. However, each contractor (BBWI, ANL-W and NRF) administer their own drinking water programs in place. The Drinking Water Program was established to monitor drinking water and production wells, which are multiple-use wells for industrial use, fire safety, and drinking water. The Drinking Water Program monitors drinking water to ensure it is safe for consumption and to demonstrate that it meets federal and state regulations (that MCLs are not exceeded). The Idaho Regulations for Public Drinking Water Systems and the federal Safe Drinking Water Act establish requirements for the Drinking Water Program.A program to monitor lead and copper in drinking water in accordance with EPA regulations has been in place since 1992. Three successive years of monitoring lead and copper levels in drinking water were concluded in 1995. Since regulatory values were not exceeded, this monitoring has been reduced to once every three years beginning in 1998.

As one of the requirements of the National Pollutant Discharge Elimination System General Permit effective October 1, 1992, the INEEL was obligated to develop a storm water monitoring program. Sampling of snowmelt and rain runoff began in 1993, and it included 16 sites at eight INEEL facilities. Samples were collected from storms of at least 0.25 cm (0.1 in.) of precipitation preceded by a minimum of 72 hours without precipitation (63 FR 189 1998).

In September 1998, the EPA issued the "Final Modification of the National Pollutant Discharge Elimination System Storm Water Multi-Sector General Permit for Industrial Activities" (63 FR 189 1998). The permit requires sample collection and laboratory analysis for two of the years during every five-year cycle at potential discharge locations. This usually occurs during years two and four; the INEEL last collected and analyzed storm water samples in 2003. The permit also required continued annual monitoring from coal piles at INTEC whenever there was a discharge to the Big Lost River System. In addition, quarterly visual monitoring was required at all other designated locations.

Current Programs - USGS personnel collect samples from 178 observation or production wells and auger holes and have them analyzed for selected organic, inorganic, and radioactive substances. Sampling is performed on schedules ranging from monthly to annually. These samples are submitted to the RESL at CFA for analysis of radioactive substances and to the USGS National Water Quality Laboratory in Lakewood, Colorado, for analysis of organic and inorganic substances. The USGS also records water levels at 308 selected wells on schedules ranging from monthly to annually.

The USGS also conducts special studies of the groundwater resources of the Eastern Snake River Plain. The abstract of each study published in 2003 is provided in Appendix C. These special studies provide more specific geological, chemical, and hydrological information on the characteristics of the aquifer and the movements of chemical and radiochemical substances in the groundwater. One special USGS investigation of particular interest is the ongoing annual sampling effort in the area between the southern boundary of the INEEL and the Twin Falls/Hagerman area, known as the Magic Valley Study. This study was prompted by public concern that radiochemical and chemical constituents generated by INEEL facilities could migrate through the Snake River Plain Aquifer to the Snake River in the Twin Falls/Hagerman area. The most recent results of this study are summarized in USGS Open File Report 03-168 (Twining et. al. 2003).

The *INEL Groundwater Monitoring Plan* was updated in 2003 to include the monitoring wells, constituent lists, and sampling frequencies of current programs. The updated plan does not replace the 1993 plan but uses it as the basis for the information previously presented regarding operational history, contaminant sources, and monitoring networks for each INEEL facility. The updated plan modifies groundwater monitoring recommendations in accordance with more recent information (i.e., requirements in records of decisions), relying on existing multiple groundwater programs rather than a single comprehensive program.

The M&O contractor conducts groundwater monitoring in support of state of Idaho Wastewater Land Application Permit requirements at CFA, INTEC, and TAN as well as surveillance monitoring at INTEC. In 2003, Wastewater Land Application Permit required monitoring included collecting 231 groundwater samples yielding 700 parameter results. ANL-W also performs groundwater surveillance monitoring in support of the Record of Decision (ROD) and a submitted state of Idaho Wastewater Land Application Permit.

The M&O contractor's Drinking Water Program monitors production and drinking water wells for radiological, chemical, and bacteriological contaminants at all their INEEL facilities. Currently, 17 wells and ten distribution systems are monitored. All analyses for the program are conducted using laboratories certified by the state of Idaho or laboratories certified in other states, where this certification is accepted by the state of Idaho. The NRF and ANL-W maintain separate programs for sampling drinking water based on the requirements applicable at their facilities. Radiological and bacteriological samples from ANL-W are sent to the M&O contractor for analysis. ANL-W conducts a separate program for chemical monitoring.

M&O personnel collect quarterly onsite drinking water samples from active systems for radiological analysis. General Engineering Laboratory, located in Charleston, South Carolina, performed these analyses during 2003. Each water sample is submitted for gross analyses for alpha- and beta-emitting radionuclides. Tritium analyses are also performed on all drinking water samples collected for radiological analysis. Strontium-90 analyses are performed on quarterly samples from CFA and INTEC because historical water quality data from monitoring and observation wells indicate this water may contain ^{90}Sr concentrations above background levels.

Microwise Laboratory, located in Idaho Falls, Idaho, analyzes drinking water monthly for coliform bacteria in 2003. Previously the INEEL Environmental Hygiene Laboratory at CFA performed these analyses. However, in late 2002 this lab lost its state accreditation. The lab was moved from CFA to INTEC, but was still unable to regain its state accreditation. It was unlikely that any future effort would be made to regain accreditation. Bacteria samples will continue to be sent to Microwise in Idaho Falls. If indications of contamination by bacteria are found in a sample, that particular drinking water system is taken out of service until it can be disinfected, resampled, and tested again until it is clear of bacteria. Corrective actions to purify the water may vary among facilities.

The M&O contractor's Drinking Water Program also samples drinking water from wells and distribution systems at INEEL facilities for volatile organic compounds. Chlorinated drinking water systems are also monitored for total trihalomethanes (bromoform, bromodichloromethane, chloroform, and dibromochloromethane). Additional sampling is conducted for a variety of inorganic constituents, including metals, nitrates, and dissolved solids.

Storm water from the coal piles at INTEC did not discharge to the Big Lost River System in 2003; therefore, analytical monitoring was not required. Thus, monitoring in 2003 consisted only of quarterly visual monitoring at 22 locations and analytical monitoring at two RWMC locations and two locations at TAN.

In October 2003, the EPA Region 10 determined that three sites at the INEEL (RWMC, INTEC, and the north part of the INEEL property near Birch Creek [area around TAN]) do not have a reasonable potential to discharge storm water to waters of the United States (Ryan 2003). A subsequent letter on December 15, 2003, from the DOE-ID directed M&O contractor to cease expending further resources on compliance with the Storm Water Pollution Prevention Plan for Industrial Activities (SWPPP-IA), Storm Water Pollution Prevention Plan for Construction Activities (SWPPP-CA), and Spill Prevention Control and Countermeasures Programs at the three sites discussed in the letter from EPA (Bauer 2003). The letter further directed BBWI to conduct a technical analysis to determine any other areas at the M&O contractor INEEL that would also have the same or less potential to discharge storm water to waters of the United States. As a result of this direction by DOE-ID, construction and industrial storm water inspections, data collection, and reports have ceased for projects located at those facilities.

The ESER contractor collects drinking water samples semiannually from boundary and distant communities. Surface water samples are collected from springs in the Twin Falls/ Hagerman area and the Snake River at Idaho Falls and Bliss. Each water sample is analyzed for gross alpha and gross beta activity, and tritium.

Agricultural Products and Vegetation Monitoring

Historical Background - Milk was the first agricultural product to be monitored beginning in at least 1957. The number of samples collected per year has been relatively constant since about 1962. Because of improvements in counting technology, the detection limit for ^{131}I has decreased from about 15,000 pCi/L in early sampling to the current detection level of about 2 pCi/L.

Wheat was first sampled as part of the radioecology research program in about 1962. The current monitoring program dates back to 1963. Potatoes were first collected in 1976 as part of an ecological research project. Regular potato sampling was resumed in 1994 in response to public concern. Lettuce has been collected since 1977.

Current Programs - Milk samples are collected from both commercial and single-family dairies. A two-liter (0.5 gal) sample is obtained from each location monthly, except in Idaho Falls where a sample is collected weekly. Milk from each location is analyzed for ^{131}I, and one analysis for ^{90}Sr and tritium at each location is performed during the year.

Wheat samples are collected from grain elevators in the region surrounding the INEEL. All wheat samples are analyzed for ^{90}Sr and gamma-emitting radionuclides.

Potato samples are collected from storage warehouses in the vicinity of the INEEL, with three to five samples from distant locations. The potatoes, with skins included, are cleaned and weighed before processing. All potato samples are analyzed for ^{90}Sr and gamma-emitting radionuclides.

Prior to 2003, lettuce samples were obtained from private gardens in communities in the vicinity of the INEEL. A new sampling program was instituted in 2003 where self-contained growing boxes were distributed throughout the region, usually at existing air monitoring locations. Lettuce was then grown from seed at each location and collected when mature. The use of self-contained growing boxes has allowed the collection of samples at areas on the INEEL (e.g., EFS) and at boundary locations where lettuce could not be obtained (e.g., Atomic City). Samples are washed to remove any soil as in normal food preparation, dried, reduced to a powdered form, and weighed. All lettuce samples are analyzed for ^{90}Sr and gamma-emitting radionuclides.

The M&O contractor annually collects perennial and grass samples from around the major waste management facilities. These samples are analyzed for gamma-emitting radionuclides. ANL-W also collects vegetation samples annually from around the Industrial Waste Pond and along the Industrial Waste Ditch. These samples are analyzed for selected alpha, beta, and gamma radionuclides.

Animal Tissue Monitoring

Historical Background - Monitoring of game animals has focused on research into the movement of radionuclides through the food chain. Rabbit thyroids and bones were first sampled in 1956. In 1973, routine sampling of game animal tissues was instituted; the first studies on waterfowl that were using waste disposal ponds containing various amounts of radionuclides occurred the following year. Waterfowl studies have covered the periods 1974-1978,1984-1986, and 1994-present. In 1998, the collection of waterfowl became part of the regular surveillance program.

Mourning doves were collected in 1974 and 1975 as part of a radioecology research project. Routine dove sampling as part of the environmental surveillance program was initiated in 1996. In 1998, sampling of yellow-bellied marmots was added to the sampling program.

Sheep that have grazed onsite have been part of the routine monitoring program since a special study was conducted in 1975. Beef cattle were also monitored biennially during the period 1978 to 1986.

Current Programs - Selected tissues (muscle, liver, and thyroid) are collected from game animals accidentally killed on INEEL roads. Thyroid samples are placed in vials and analyzed within 24-hours by gamma spectrometry specifically for ^{131}I. Muscle and liver samples are processed, placed in a plastic container, and weighed before gamma spectrometry analysis.

Waterfowl samples are collected from waste disposal ponds at four facilities on the INEEL. Control samples are also taken in areas distant from the INEEL. Waterfowl samples are separated into an external portion (consisting of the skin and feathers); edible portion (muscle, liver, and gizzard tissue); and remainder portion. All samples are analyzed by gamma spectrometry. Selected samples are also analyzed for ^{90}Sr and transuranic radionuclides.

Mourning doves are collected from the vicinity of INTEC and TRA waste ponds and from a control area distant to the INEEL. Because of the small size of a typical dove, muscle tissues from several doves collected at the same location are composited into one sample. Samples are analyzed for gamma-emitting radionuclides, ^{90}Sr, and transuranic radionuclides.

Marmots are collected from the vicinity of the RWMC and a control area distant to the INEEL, usually Pocatello. Marmot samples are separated into three portions an external portion (consisting of the skin and fur); edible portion (muscle, liver, and gizzard tissue); and viscera portion (remaining internal organs). All samples are analyzed by gamma spectrometry. Selected samples are also analyzed for ^{90}Sr and transuranic radionuclides.

Soil Monitoring

Historical Background - Soil sampling has been included as part of routine monitoring programs since the early 1970s, although some limited soil collection was performed around various facilities as far back as 1960. Offsite soil sampling at distant and boundary locations was conducted annually from 1970 to 1975. The collection interval was extended to every two years starting in 1978. Soil samples in 1970, 1971, and 1973 represented a composite of five cores of soil five-centimeters (two-inches) in depth from a one square meter (approximately ten square feet) area. In all other years, the five cores were collected from two depths zero to five centimeters (0-5 cm) (zero to two inches [0-2 in.]) and five to ten centimeters (5-10 cm) (two to four inches [2-4 in.]) within a 100-m^2 (~1076 ft^2) area.

A soil sampling program began in 1973 around onsite facilities. Soils at each facility were sampled every seven years. In 2001, all locations were sampled as the frequency was increased to every two years.

Current Programs - Twelve offsite locations are sampled in even numbered years. Following collection, soil samples are dried for at least three hours at 120°C (250°F) and sieved. Only soil particles less than 500 µ in diameter (35 mesh) are analyzed. All offsite samples are analyzed for gamma-emitting radionuclides, ^{90}Sr, and transuranic radionuclides.

The M&O contractor now performs soil sampling on a two-year rotation. One hundred eighty-six sites were sampled in 2003. All sites are analyzed in-situ for gamma-emitting radionuclides and ^{90}Sr. Approximately 10 percent of the sites have a physical sample collected for laboratory analysis of gamma-emitting and transuranic radionuclides. Samples are collected from 0-5 cm (0-2 in.) and sieved at the sample site with the 35-mesh fraction being collected. The M&O contractor also performs annual sampling of the CFA sewage treatment plant irrigation spray field to show compliance with the Wastewater Land Application Permit soil loading limits.

ANL-W collects soil samples annually at locations along the major wind directions and at crosswind locations. Samples are analyzed for low-level gamma-emitting radionuclides, and uranium, plutonium, and thorium isotopes. Sufficient material to fill a 500 mL (16 oz.) wide mouth jar is collected from 0-5 cm (0-2 in.) depth within an approximately 1-m ^{2} (~10-ft^{2}) area.

Direct Radiation Monitoring

Historical Background - Measurements of radiation in the environment have been made on the INEEL since 1958. The technology used for radiation measurements at fixed locations has evolved from film badges to thermoluminescent dosimeters (TLDs). In addition to these locations, surveys using hand-held and vehicle-mounted, radiation instruments have been conducted since at least 1959. Aerial radiological surveys were also performed in 1959, 1966, 1974, 1982, and 1990.

Current Programs - Environmental TLDs are used to measure ambient ionizing radiation exposures. The TLDs measure ionizing radiation exposures from all external sources. External sources include natural radioactivity in the air and soil, cosmic radiation from space, residual fallout from nuclear weapons tests, radioactivity from fossil fuel burning, and radioactive effluents from INEEL operations and other industrial processes.

At each location, a dosimeter holder containing four individual chips is placed one meter (three feet) above ground level. The M&O contractor maintains dosimeters at 13 offsite locations and 135 locations on the INEEL. The ESER contractor has dosimeters at 14 offsite locations. The dosimeter card at each location is changed semiannually, and cumulative gamma radiation is measured by the M&O contractor Dosimetry Unit.

In addition to TLDs, the M&O contractor uses a mobile global positioning system radiometric scanner arrangement to conduct gamma radiation surveys. Two plastic scintillation detectors and radiometric and global positioning system equipment are mounted on a four-wheel drive vehicle. The vehicle is driven slowly across the area to be surveyed while radiometric and location data are continuously recorded.

ANL-W conducts annual surface radiation surveys of wastewater ditches using hand-held portable beta-gamma meters. In addition to these surveys ANL-W also maintains a network of four high pressure ionization chambers to monitor ambient airborne radiation. The high pressure ionization chambers are oriented to the facility in the two major wind directions (northeast and southwest) and two cross-wind directions (north-northwest and southeast).

Meteorological Monitoring

Historical Background - The NOAA Air Resources Laboratory-Field Research Division (NOAA ARL-FRD) began work at the INEEL in 1948 as a Weather Bureau Research Station. The first meteorological observation station established to support the Site began operation in 1949 at CFA. The network of stations expanded in the 1950s to provide more closely spaced data. The current mesonet was designed and constructed in the 1990s.

Current Programs - NOAA ARL-FRD currently maintains a network of 36 meteorological stations in the vicinity of the INEEL. These stations provide continuous measurements of a variety of parameters, including air temperature at two or three elevations, wind direction and speed, relative humidity, barometric pressure, solar radiation, and precipitation. In addition, continuous measurements of wind speed/direction and air temperature at various heights above the ground are taken using a radar wind profiling system and a radio acoustic sounding system located on the INEEL. Data are transmitted via radio and telephone to the NOAA ARL-FRD Idaho Falls facility, where they are stored in a computerized archive.

Monitoring and Surveillance Committee

The INEEL Monitoring and Surveillance Committee was formed in March 1997 and holds bimonthly meetings to coordinate activities between groups involved in INEEL-related onsite and offsite environmental monitoring. This standing committee brings together representatives of DOE (Idaho, Chicago, and Naval Reactors); INEEL contractors; ANL-W; NRF; Shoshone-Bannock Tribes; Idaho INEEL Oversight Program; NOAA; and USGS. The Monitoring and Surveillance Committee has served as a valuable forum to review monitoring, analytical, and quality assurance methodologies; to coordinate efforts; and to avoid unnecessary duplication.

Monitoring Summary

Tables 3-2 through 3-5 present a summary of the environmental surveillance programs conducted by the ESER contractor, the M&O contractor, ANL-W, and the USGS, respectively, in 2003.

3.2 Accelerated Cleanup Agreement

In May 2002, DOE, the Idaho Department of Environmental Quality (DEQ), and the EPA signed a letter of intent formalizing an agreement to pursue accelerated risk reduction and cleanup at the INEEL. The letter provides the foundation for a collaborative plan for the accelerated cleanup of the INEEL.

Table 3-2. ESER environmental surveillance program summary (2003).

Medium Sampled	Type of Analysis	Locations and Frequency: Onsite	Locations and Frequency: Offsite	Minimum Detectable Concentration
Air (low volume)	Gross alpha	4 weekly[a]	14 weekly[a]	1×10^{-15} µCi/mL
	Gross beta	4 weekly[a]	14 weekly[a]	2×10^{-14} µCi/mL
	Specific gamma	4 quarterly[a]	14 quarterly[a]	3×10^{-16} µCi/mL
	^{238}Pu	1-2 quarterly	7 quarterly	2×10^{-18} µCi/mL
	$^{239/240}Pu$	1-2 quarterly	7 quarterly	2×10^{-18} µCi/mL
	^{241}Am	1-2 quarterly	7 quarterly	2×10^{-18} µCi/mL
	^{90}Sr	1-2 quarterly	7 quarterly	6×10^{-17} µCi/mL
	^{131}I	4 weekly[a]	14 weekly[a]	2×10^{-15} µCi/mL
	Total particulates	4 quarterly[a]	14 quarterly[a]	10 µg/m^3
Air (high volume)[b]	Gross beta	None	1, twice per week	1×10^{-15} µCi/mL
	Gamma scan	None	If gross gamma > 1 pCi/m^3	1×10^{-14} µCi/mL
	Isotopic U and Pu	None	1 annually	2×10^{-18} µCi/mL
Air (PM_{10})	Weighing filter	None	3 weekly	± 0.000001 g
Air (atmospheric moisture)	Tritium	None	4 locations, 2 to 4 per quarter	2×10^{-13} µCi/mL (air)
Air (precipitation)	Tritium	1 weekly/ 1 monthly[c]	1 monthly	100 pCi/L
Drinking Water	Gross alpha	None	13 semiannually	3 pCi/L
	Gross beta	None	13 semiannually	2 pCi/L
	Tritium	None	13 semiannually	300 pCi/L
Surface Water	Gross alpha	None	5 semiannually	3 pCi/L
	Gross beta	None	5 semiannually	2 pCi/L
	Tritium	None	5 semiannually	300 pCi/L
Animal Tissue (sheep)[c]	Specific gamma	4 annually	2 annually	5 pCi/g
	^{131}I	4 annually	2 annually	3 pCi/g
Animal Tissue (game)	Specific gamma	Varies annually[d]	Varies annually	5 pCi/g
	^{131}I			3 pCi/g
Agricultural Products (milk)	^{137}Cs	None	1 weekly	1 pCi/L
	^{131}I	None	1 weekly/9 monthly	3 pCi/L
	^{90}Sr	None	9 annually	5 pCi/L
	Tritium	None	9 annually	300 pCi/L
Agricultural Products (potatoes)	Specific gamma	None	11 annually	0.1 pCi/g
	^{90}Sr	None	11 annually	0.2 pCi/g
Agricultural Products (wheat)	Specific gamma	None	13 annually	0.1 pCi/g
	^{90}Sr	None	13 annually	0.2 pCi/g
Agricultural Products (lettuce)	Specific gamma	None	9 annually	0.1 pCi/g
	^{90}Sr	None	9 annually	0.2 pCi/g
Soil	Specific gamma	None	12 biennially	0.001 pCi/g
	^{238}Pu	None	12 biennially	0.005 pCi/g
	$^{239/240}Pu$	None	12 biennially	0.1 pCi/g
	^{241}Am	None	12 biennially	0.005 pCi/g
	^{90}Sr	None	12 biennially	0.05 pCi/g
Direct Radiation Exposure (TLDs)	Ionizing radiation	None	14 semiannually	5 mR

a. Onsite include three locations and a blank, offsite includes 13 locations and a blank.

b. Filter are collected by ESER personnel and sent to EPA for analysis. Data are reported by EPA's Environmental Radiation Ambient Monitoring System (ERAMS) at http://www.epa.gov/narel/erams/.

c. A portion of the monthly sample collected at Idaho Falls is sent to EPA for analysis and are reported by ERAMS.

d. Onsite animals grazed on the INEEL for at least two weeks before being sampled. Offsite animals have never grazed on the INEEL and served as controls.

e. Only animals that are victims of road-kills or natural causes are sampled onsite. No controls are generally collected except for specific ecological studies (i.e., ducks).

Table 3-3. M&O contractor site environmental surveillance program summary (2003).

Medium Sampled	Type of Analysis	Locations and Frequency		Minimum Detectable Concentration
		Onsite	Offsite	
Air (low volume)	Gross alpha	13 weekly	4 weekly	1 x 10^{-15} µCi/mL
	Gross beta	13 weekly	4 weekly	5 x 10^{-15} µCi/mL
	Specific gamma	13 quarterly	4 quarterly	—[a]
	^{238}Pu	13 quarterly	4 quarterly	2 x 10^{-18} µCi/mL
	^{241}Am	13 quarterly	4 quarterly	2 x 10^{-18} µCi/mL
	^{90}Sr	13 quarterly	4 quarterly	2 x 10^{-14} µCi/mL
	Particulate matter	13 quarterly	4 quarterly	10 µg/m^3
Air (atmospheric moisture)	Tritium	2 to 4 per quarter	2 to 4 per quarter	1 x 10^{-11} µCi/mL (water)
Air	Nitrogen oxides	Continuous	—[b]	NA[c]
Air	Sulfur dioxide	Continuous	—	NA
Soil	Specific gamma	Varies annually[d]	—	0.1 pCi/g
	Pu isotopes	Varies annually	—	0.003 pCi/g
	^{241}Am	Varies annually	—	0.003 pCi/g
	^{90}Sr	Varies annually	—	0.06 pCi/g
Vegetation	Specific gamma	Varies annually[d]	—	1 x 10^{-7} µCi/g
	^{238}Pu	Varies annually	—	1.2 x 10^{-8} µCi/g
	$^{239/240}$Pu	Varies annually	—	6 x 10^{-10} µCi/g
	^{241}Am	Varies annually	—	1.2 x 10^{-8} µCi/g
	^{90}Sr	Varies annually	—	1.2 x 10^{-8} µCi/g
Drinking Water	Gross alpha	12 quarterly	—	1 pCi/L
	Gross beta	12 quarterly	—	4 pCi/L
	Tritium	12 quarterly	—	1,000 pCi/L
	^{90}Sr	4 quarterly	—	2 pCi/L
	Other radionuclides	12 quarterly	—	[a]
	Volatile organics	10 annually/ 4 quarterly	—	Varies by analyte
	Semivolatile organics	12 triennially	—	Varies by analyte
	Inorganics	12 triennially	—	Varies by analyte
Direct Radiation Exposure (TLDs)	Ionizing radiation	135 semiannually	13 semiannually	5 mR
Direct Radiation Exposure (mobile radiation surveys)	Gamma radiation	Facilities and INEEL roads[e]	—	NA

a. Minimum detectable concentration for gamma spectroscopic analyses varies depending on radionuclide.

b. Denotes that the M&O contractor does not collect samples from offsite locations for this parameter.

c. NA = not applicable. This information is recorded as an instrument reading at the time of inspection.

d. Onsite soil sampling is performed each year at different onsite facilities on a rotating two-year schedule.

e. Surveys are performed each year at different onsite facilities on a rotating three-year schedule. All INEEL roadways over which waste is transported are surveyed annually.

Table 3-4. ANL-W site environmental surveillance program summary (2003).

Medium Sampled	Type of Analysis	Frequency	Minimum Detectable Concentration
Airborne Effluents	Nitrogen oxides	Continuous	NA[a]
Airborne Effluents	Sulfur dioxide	Continuous	NA
Soil	Specific gamma	7 annually	0.7 pCi/g
	Pu, Th, U isotopes	7 annually	0.005 pCi/g
	Metals	1 annually	Varies by analyte
Vegetation	Specific gamma	8 annually	0.7 µCi/g
	Pu, Th, U isotopes	8 annually	0.005 µCi/g
Drinking Water	Gross alpha	1 quarterly	1 pCi/L
	Gross beta	1 quarterly	4 pCi/L
	Tritium	1 quarterly	1000 pCi/L
	Inorganics	1 every 9 years	Varies by analyte
	Lead/copper	20 triennially	3.0 µg/L/1.5 µg/L
	Nitrate	1 annually	0.1 mg/L
	Cyanide	1 triennially	10 µg/L
	Arsenic	1 triennially	1.7 µg/L
	Coliform bacteria	1 quarterly	Presence
	Volatile organics	1 every six years[b]	Varies by analyte
	Semivolatile organics	1 every six years[b]	Varies by analyte
Surface Water	Inorganics	1 annually	Varies by analyte
	Anions	2 annually	Varies by analyte
	Gross Alpha	3 monthly	3 pCi/L
	Gross Beta	3 monthly	2 pCi/L
	Gamma Spec	3 monthly	Varies by analyte
	Tritium	3 monthly	400 pCi/L
	Water Quality Parameters[c]	3 monthly	Varies by analyte
Groundwater	Inorganics	5 semiannually	Varies by analyte
	Anions (Cl, SO_4, NO_3)	5 semiannually	Varies by analyte
	TOC[d]	5 semiannually	260 µg/L
	TOX[d]	5 semiannually	2.4 µg/L
	Gross Alpha	5 semiannually	3 pCi/L
	Gross Beta	5 semiannually	2 pCi/L
	Uranium isotopes	5 semiannually	Varies by analyte
	Tritium	5 semiannually	400 pCi/L
	Water Quality Parameters[e]	5 semiannually	Varies by analyte
Direct Radiation Exposure (HPICs)[f]	Ionizing radiation	4 Continuous	10 µR
Direct Radiation Exposure (portable radiation survey)	Gamma radiation	1 annually	NA

a. NA = not applicable. This information is recorded as an instrument reading at the time of inspection.

b. Surface water quality parameters include pH, temperature, specific conductivity, dissolved oxygen, and turbidity/total dissolved solids.

c. Monitoring is required triennially unless waiver obtained from the state.

d. TOC = Total Organic Carbon; TOX = Total Organic Halogens.

e. Groundwater quality parameters include pH, total alkalinity, bicarbonate alkalinity, carbonate alkalinity, total dissolved solids, and specific conductivity.

f. HPIC = High Pressure Ionization Chamber.

Table 3-5. U.S. Geological Survey monitoring program summary (2003).

Constituent	Groundwater		Surface water		Minimum Detectable Concentration
	Number of Sites	Number of Samples	Number of Sites	Number of Samples	
Gross Alpha	53	65	4	8	3 pCi/L
Gross Beta	53	65	4	8	3 pCi/L
Tritium	163	253	7	14	400 pCi/L
Specific Gamma	94	138	4	8	—[a]
Strontium-90	111	183	—[b]	—	5 pCi/L
Americium-241	21	36	—	—	0.05 pCi/L
Plutonium Isotopes	21	36	—	—	0.04 pCi/L
Specific Conductance	163	254	7	14	Not applicable
Sodium Ion	152	168	—	—	0.1 mg/L
Chloride Ion	163	254	7	14	0.1 mg/L
Nitrates (as nitrogen)	115	129	—	—	0.05 mg/L
Sulfate	108	120	—	—	0.1 mg/L
Chromium (dissolved)	91	121	—	—	0.005 mg/L
Purgeable Organic Compounds[c]	28	51	—	—	0.0002 mg/L
Total Organic Carbon	51	53	—	—	0.1 mg/L
Trace Elements	91	121	—	—	varies

a. Minimum detectable concentration for gamma spectroscopic analyses varies depending on radionuclide.

b. No surface water samples collected for this constituent.

c. Each purgeable organic compound water sample is analyzed for 60 volatile organic compounds.

DOE-ID and its contractors, in consultation with the state of Idaho and EPA, developed a Performance Management Plan describing the approach to accelerate the reduction of environmental risk at the INEEL by completing its cleanup responsibility faster and more efficiently. The plan will fulfill the following two visions:

- By 2012, the INEEL will have achieved significant risk reduction and will have placed materials in safe storage ready for disposal.

- By 2020, the INEEL will have completed all active cleanup work with potential to further accelerate cleanup to 2016.

The vision for accelerating cleanup of the INEEL results in two objectives: (1) risk reduction and continued protection of the Snake River Plain Aquifer and (2) consolidation of Environmental Management activities and reinvestment of savings into cleanup.

Nine strategic initiatives were developed around these objectives to accelerate cleanup. They include

- Accelerate Tank Farm Closure;
- Accelerate high-level waste calcine removal from Idaho;
- Accelerate consolidation of spent nuclear fuel to the INTEC;
- Accelerate offsite shipments of transuranic waste stored in the transuranic waste storage area;
- Accelerate remediation of miscellaneous contaminated areas;
- Eliminate onsite treatment and disposal of low-level and mixed low-level waste;
- Transfer all Environmental Management-managed special nuclear material offsite;
- Remediate buried waste in the RWMC; and
- Accelerate consolidation of INEEL facilities and reduce the total building footprint.

At the 2020 end state, some activities will continue: shipment of spent nuclear fuel to a repository; retrieval, treatment, packaging, and shipment of calcined high-level waste to a repository; and final dismantlement of remaining Environmental Management buildings. These activities will be complete by 2035 with the exception of some minor activities leading to long-term stewardship (see Section 3.4). Even with these continuing activities, the cleanup costs can be reduced by up to $19 billion, and the cleanup schedule can be completed decades earlier. The Performance Management Plan is a living document that will be revised and improved as necessary to reflect the decisions and progress made towards accelerated cleanup. INEEL made significant progress in 2003, most notably:

- Demolished over 5,574 m^2 (60,000 ft^2) of buildings and structures;
- Completed physical remediation of Waste Area Group 4 (CFA);
- Completed excavation of Glovebox Excavation Method Project overburden;
- Began disposal of Comprehensive Environmental Response Compensation and Liability Act (CERCLA) soil in the INEEL CERCLA Disposal Facility (ICDF);
- Initiated decontamination and decommissioning activities at TAN and PBF; and
- Cleaned and sampled five Pillar and Panel high-level waste tanks at the INTEC.

Accelerated cleanup activities are further discussed through this Chapter in specific program emphasis areas.

3.3 Environmental Restoration

Since the Federal Facility Agreement and Consent Order (FFA/CO) was signed in December 1991, the INEEL has cleaned up sites containing asbestos, petroleum products, acids and bases, radionuclides, unexploded ordnance and explosive residues, polychlorinated biphenyls, heavy metals, and other hazardous materials. Cleanup of this contamination is being conducted under the CERCLA. By the end of 2003

- Twenty-two RODs have been signed and are being implemented;
- Three Remedial Investigation/Feasibility Studies (RI/FSs) are under development;
- Closeout activities at Waste Area Group 2 have been completed; and
- More than 70 percent of CERCLA actions are complete.

By progressing on these cleanup projects, workers were able to significantly reduce risks posed by past contamination at INEEL facilities. Also, by reducing the number of unneeded buildings at the INEEL, money that would otherwise have been applied to upkeep can now be applied to cleanup projects.

Comprehensive RI/FSs have been completed for Waste Area Groups (WAGs) 1, 2, 3, 4, 5, 8, 9, and 10. The comprehensive RI/FSs, which take an average of 40 months to complete, accomplish the following:

- Determine the cumulative risks for an entire WAG by assessing the combined impact of all release sites within that group;
- Review assumptions used in each previous investigation, including "No Further Action" sites, Track 1 and 2 limited field investigations, RI/FSs, and interim actions;
- Identify data gaps and recommend actions, such as field sampling or historical document research, to resolve questions;
- Perform feasibility studies to evaluate remedial alternatives for the entire WAG.

The information in the RI/FS is summarized in a Proposed Plan which is provided for public comment. Proposed Plans present the alternatives and recommending a preferred alternative After consideration of public comments DOE develops RODs selecting the alternative.

The general procedure for all comprehensive investigations begins with developing a work plan outlining potential data gaps and release sites that may require more field sampling. When the investigation is complete, DOE, EPA and the State hold public comment meetings on the proposed cleanup alternative. Only three investigations remain to be completed:

- Buried waste at the RWMC (WAG 7);

- Soil contamination at the INTEC Tank Farm (WAG 3, Operable Unit 3-14); and
- Snake River Plain Aquifer contamination (WAG 10, Operable Unit 10-8).

A complete catalog of documentation associated with the INEEL FFA/CO is contained in the CERCLA Administrative Record at http://ar.inel.gov/. The location of each WAG is shown on Figure 3-3.

Waste Area Group 1 - Test Area North

In 2003, the Agencies agreed on a new remedy for the V-tank waste. The V-tanks site consists of four underground storage tanks, related structures, and the surrounding contaminated soil. There are three out-of-service 37,854 L (10,000 gallon) and one 1514 L (400 gallon) underground storage tanks. The contents are contaminated with radionuclides, heavy metals, and organic compounds. The out-of-state treatment remedy selected in the 1999 ROD is no longer available. The amended remedy is soil and tank removal, chemical oxidation/reduction with stabilization of the tank contents, and disposal. The major treatment activities will take place at the V-tanks site or in adjacent areas, as necessary.

The remedy for the PM-2A tanks was also amended. The waste in the PM-2A tanks is similar to that of the V-tanks except that in the early 1980's an absorbent was added to the tanks in an attempt to solidify the waste. The 1999 ROD remedy for the PM-2A tanks specified that the tank contents would be removed from the tank by vacuum extraction, treated if necessary, and disposed on site. During the design of the remedy, it was determined that the tanks were structurally sound enough to be removed intact with the waste still inside. This alternate remedy reduces the potential for worker exposure during excavation and treatment.

Additional activities in 2003 include:

- Obtained approval to operate a landfill for uncontaminated construction and demolition debris resulting from dismantlement of structures at TAN;
- Submitted Operable Unit 1-10, Group 3 Draft Remedial Design/Remedial Action Work Plan;
- Submitted Operable Unit 1-07B New Pump and Treat Facility Draft Operations and Maintenance Plan; and
- Submitted Operable Unit 1-07B Monitoring Natural Attenuation Draft Remedial Design/Remedial Action Work Plan.

Waste Area Group 2 - Test Reactor Area

A review of all CERCLA remediations completed under the WAG 2 ROD was completed in 2003 and all requirements have been met. The review covered all WAG 2 CERCLA decision documents; operations, maintenance, and monitoring plans; identified sites investigated in each type of document (Track 1, Track 2, RI/FS, etc.); and closeouts of subcontracts, charge numbers, and total gathered costs. All identified FFA/CO-enforceable milestones related to the WAG 2

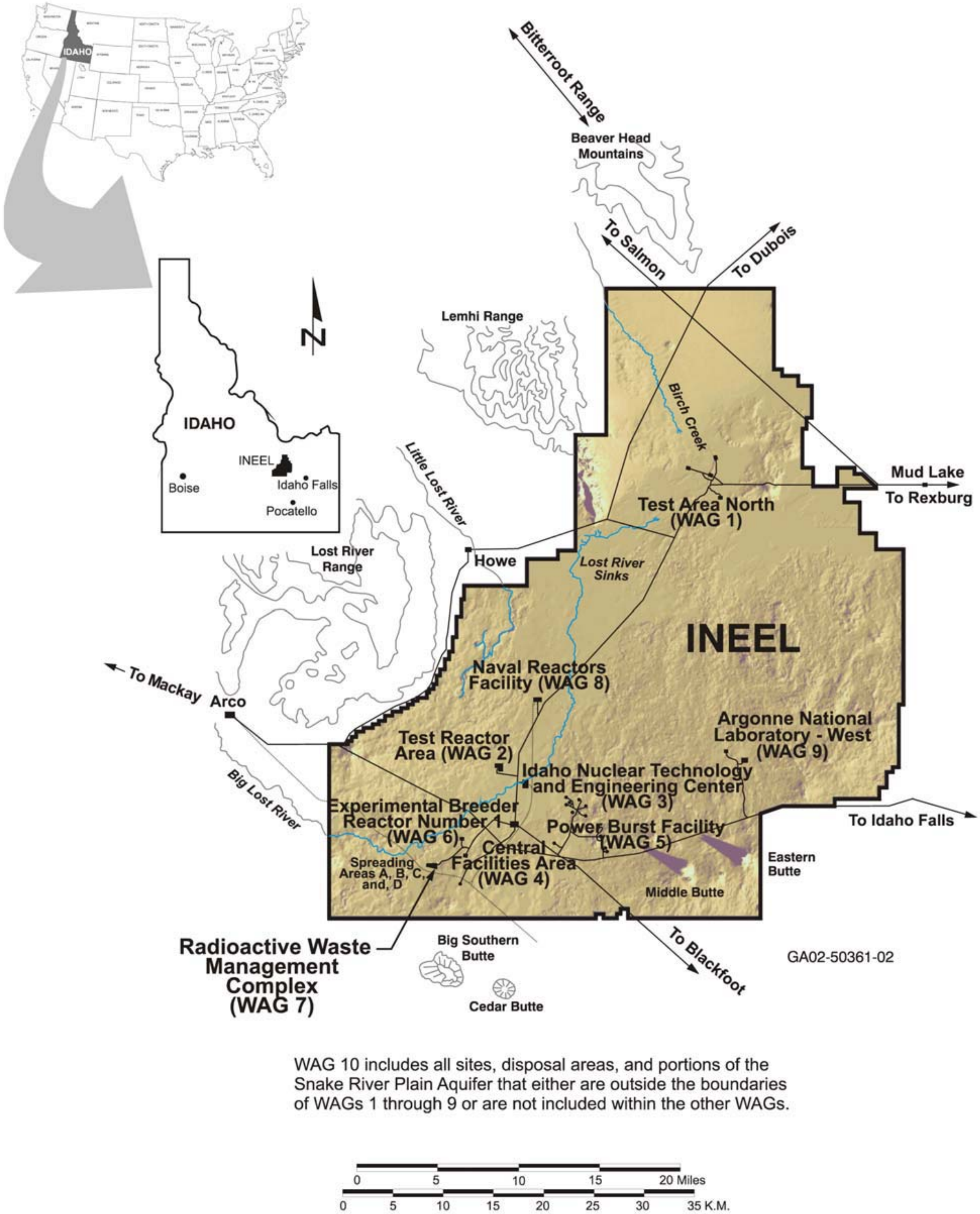

Figure 3-3. Relief map of the INEEL showing locations of the facilities and corresponding waste area groups.

ROD have been completed. New sites that were identified after the ROD was signed are addressed in the OU 10-08 ROD. Most importantly, the review concluded that the selected remedies were protective of human health and the environment. This is the first WAG at the INEEL to be closed out and prepared for transition into Long-Term Stewardship management.

Waste Area Group 3 - Idaho Nuclear Technology and Engineering Center

Operations at the ICDF commenced in 2003, disposing of over 18,000 tons of contaminated soil and materials. This site consolidates low-level contaminated soils and debris from sitewide INEEL cleanup operations and segregates those wastes from potential migration to the aquifer, reducing risk to the public and environment. Other major accomplishments at WAG 3 include:

- Submitted the Operable Unit 3-14 Tank Farm RI/FS Draft Work Plan;
- Completed Phase I of the Operable Unit 3-13 Tank Farm Interim Action (evaporation pond liner and drainage ditches) identified in the 2002 Notice of Violation;
- Completed field work on Operable Unit 3-13 Group 6, Buried Gas Cylinders CPP-94 site remediation;
- Submitted Operable Unit 3-13 Group 7 Draft Remedial Design/Remedial Action Work Plan; and
- Submitted Operable Unit 3-13 Group 3 WAG 3 Soils Draft Remedial Design/Remedial Action Work Plan.

Waste Area Group 4 - Central Facilities Area

In 2003, the Agencies agreed to change the remedy for CFA-04, a pond that was contaminated with mercury from experiments that took place in the Chemical Engineering Laboratory. Based on new EPA guidelines, the final remediation goal for the pond soil is increased and the requirement to backfill the pond with clean soil is eliminated. Soil that exceeds the remediation goal of 8.4 mg/kg was excavated as deep as 3 m (10 ft) below ground surface or to basalt, depending on the depth of contamination. The excavated soil was disposed at the ICDF or the CFA landfill. Excavated soil that met the characteristics for hazardous waste for mercury was stabilized with concrete before disposal.

An FFA/CO-enforceable milestone was achieved with the submittal of the Operable Unit 4-13 CFA-04 Draft Remedial Design/Remedial Action Work Plan.

Waste Area Group 5 - Power Burst Facility/Waste Reduction Operations Complex

This area supported two reactor facilities-the PBF and the Auxiliary Reactor Area (ARA). Cleanup activities at WAG 5 are nearly complete. Soil contamination in the ARA will be remediated in 2004.

Waste Area Group 6/10 - Experimental Breeder Reactor I/ Boiling Water Reactor Experiment, Miscellaneous Sites, Snake River Plain Aquifer

The following accomplishments were achieved at WAG 6/10 in 2003:

- Submitted Operable Unit 10-04 Draft Remedial Design/Remedial Action Work Plan for Sitewide Institutional Controls and Ecological Monitoring; and

- Issued the Long-Term Ecological Monitoring Plan for the INEEL to determine that the long-term INEEL-wide ecological impact of the contamination left in place is within acceptable limits.

Waste Area Group 7 - Radioactive Waste Management Complex

Waste Area Group 7 includes the Subsurface Disposal Area (SDA), a 39-hectare (97-acre) disposal area containing buried hazardous and radioactive waste. Organic solvents contained in this waste are a source of groundwater contamination and are being removed by an ongoing cleanup action. Projects are currently underway to gain more information about the contents of the pits and trenches of the SDA to aid decision-makers in determining the best treatment technology. The State, EPA, and DOE-ID agreed on a revised technical approach, the Glovebox Excavator Method project or GEM, to demonstrate retrieval from a small area of Pit 9. Workers will remotely excavate wastes and examine them in a shielded confinement structure or glovebox. The glovebox operates under negative air pressure to prevent contamination from escaping. The waste will be treated for shipment to the Waste Isolation Pilot Plan in New Mexico. The following accomplishments were achieved at WAG 7 in 2003:

- Continued the Organic Contamination in the Vadose Zone Project, which vacuums solvent vapors that have escaped from buried waste. The vapors are brought to the surface and destroyed using thermal and catalytic processes. Since the beginning of operations in January 1996, more than 88,128 kg (194,289 lb) of these contaminants have been removed and destroyed.

- GEM operations commenced with removal of the soil overburden. Waste excavation will begin in 2004.

Waste Area Group 8 - Naval Reactors Facility

The Naval Reactors Facility (NRF) is operated for the U.S. Naval Nuclear Propulsion Program by Bechtel Bettis, Inc., Bettis Atomic Power Laboratory-Idaho. Developmental nuclear fuel material samples, naval spent fuel, and irradiated reactor plan components/materials are examined at the Expended Core Facility. The knowledge gained from these examinations is used to improve current designs and to monitor the performance of existing reactors. The naval spent fuel examined at Expended Core Facility is critical to the design of longer-lived cores, which results in the creation of less spent fuel requiring disposition. NRF is also preparing naval fuel for dry storage and eventual transportation to a repository. Remedial actions at NRF in 2003 included the following:

- Phase I Remedial Actions which included the excavation of contaminated soil and pipe and removal of concrete structures was completed. The pipe and concrete have been sent offsite (away from NRF) as low-level radioactive waste and the soil was consolidated onsite in preparation for containment within an engineered cover; and

- Phase II Remedial Actions including the construction of three engineered covers over contaminated soil areas continued. This effort will be completed in 2004.

Waste Area Group 9 - Argonne National Laboratory-West

DOE received post-phytoremediation soil sampling results from four sites at ANL-West. The results showed that remediation goals were met at the cesium-contaminated Interceptor Canal Mound site (ANL-09), and the Main Cooling Tower Blowdown Ditch (ANL-01A). Small areas of residual metals contamination were detected in two sites, Ditch A (ANL-01), and the Industrial Waste Discharge Ditch (ANL-35). A Scope of Work was developed to excavate these localized areas of residual contamination. The total amount of residual contaminated soil to be excavated is less than 76 m^3 (100 yd^3). Excavation work is scheduled for August 30, 2004.

CERCLA Public Health Assessment

The Agency for Toxic Substances and Disease Registry (ATSDR) has conducted a public health assessment of the INEEL as required by CERCLA for all sites on the National Priorities List. The focus of the public health assessment is to provide information about the impact of past activities on the health of citizens living near the INEEL. ATSDR released the draft public health assessment for public review and comment in 2003.

3.4 INEEL Long-Term Stewardship Program

Completing the remediation activities at the INEEL in compliance with the regulatory agreements governing them will result in residual contamination remaining at some locations onsite. The sites where residual contaminants remain will require long-term stewardship (LTS) to prevent unacceptable contact between waste residue and the public, and to initiate subsequent cleanup activities in the event of an unforeseen increase in contaminant transport through the soil or groundwater. The term LTS refers to all activities necessary to protect human health and the environment following completion of remediation, disposal, or stabilization of a site or a portion of a site. The INEEL considers the scope of LTS to also include conserving ecological and cultural resources and maintaining awareness of changes in technology, regulations, and policy affecting these stewarded sites.

While LTS activities such as monitoring groundwater, conducting surveillance of remedies and maintenance of caps and landfills, and restricting access to residually contaminated sites have been conducted for years at the INEEL under the auspices of several different programs, DOE recognized that management advantages could be gained by consolidating these similar activities into one program. In fiscal year 2000, DOE-ID developed a schedule for creating an INEEL LTS Plan to describe the strategic and tactical elements of a consolidated LTS Program at the INEEL.

Creation of an LTS Program represents a management consolidation of post-remediation responsibilities, regardless of what law or agreement governs the remedy. Consolidating these activities does not change any agreed-upon obligations for the operation, maintenance, monitoring, institutional control, or post-closure care identified in RODs, Hazardous Waste Management Act/Resource Conservation Recovery Act (RCRA) closure plans, or other agreements. Rather, creation of the INEEL LTS Program is a way to implement post-remediation responsibilities agreed to under a variety of regulations in a more efficient and focused manner.

Development of INEEL LTS Plan

The INEEL LTS Plan consists of two parts: (1) a strategic portion, in which the overall vision, mission, objectives, and goals of the program will be captured and (2) a tactical portion, which will document the specific activities and schedules necessary to achieve the vision, mission, objectives, and goals.

Regulators, environmental advocates, state and local governments, federal and state land and resource management agencies, the Shoshone-Bannock Tribes, and the general public developed the vision, mission, and objectives of the INEEL LTS Program that forms the foundation of the INEEL LTS Strategic Plan published in 2002. The INEEL LTS Implementation Plan published in 2003 describes specific long-term stewardship activities that meet the objectives of the LTS Strategic Plan and also identifies additional activities and modifications to current systems needed to meet Strategic Plan objectives. Combined, the two documents constitute the INEEL LTS Plan. Both Plans can be accessed at http://cleanup.inel.gov/stewardship/.

3.5 Waste Management

The INEEL's waste management activities provide safe, compliant, and cost-effective management services for facility waste streams. Safe operations and compliance with applicable federal, state, and local regulations are the highest priorities along with meeting the commitments made in the Idaho Settlement Agreement and the INEEL Site Treatment Plan.

Federal Facility Compliance Act

The Federal Facility Compliance Act requires the preparation of a site treatment plan for the treatment of mixed wastes (those containing both radioactive and nonradioactive hazardous materials) at the INEEL.

In accordance with the Site Treatment Plan, the INEEL began receiving offsite mixed waste for treatment in January 1996. The INEEL received mixed waste from other sites within the DOE complex including Hanford, Los Alamos, Paducah, Pantex, Sandia, and six locations managed by the Office of Naval Reactors. The INEEL is storing the backlog of mixed waste in permitted storage at the Waste Reduction Operations Complex and INTEC. The Site Treatment Plan requires that disposal of the backlog of mixed waste will occur by no later than 2006; under the INEEL's accelerated cleanup initiative, the backlog will be eliminated in 2004, two years earlier than the scheduled milestone.

During 2003, the following Site Treatment Plan milestones were met:

- Commercial treatment/disposal of a backlog -- 120 m^3 (157 yd^3);
- Sodium Components Maintenance Shop treatment backlog -- 2.0 m^3 (70.6 ft^3);
- High-efficiency particulate air filter leach treatment -- 0.9 m^3 (31.8ft^3);
- Debris backlog treatment -- 52 m^3 (1836 ft^3); and
- Advanced Mixed Waste Treatment Project commence operations.

Advanced Mixed Waste Treatment Project

The overall goal of the Advanced Mixed Waste Treatment Project is the treatment of alpha-containing low-level mixed and transuranic (TRU) wastes for final disposal by a process that minimizes overall costs while ensuring safety. This will be accomplished through a private sector treatment facility with the capability to treat specified INEEL waste streams and the flexibility to treat other INEEL and DOE regional and national waste streams. The facility will treat waste to meet the most current requirements; reduce waste volume and life-cycle cost to DOE; and perform tasks in a safe, environmentally compliant manner.

A contract for treatment services was awarded to British Nuclear Fuels Limited, Inc. in December 1996. They completed construction of the facility in December 2002, fulfilling a Settlement Agreement milestone. Advanced Mixed Waste Treatment Plant retrieval operations commenced in March 2003.

High-level Waste and Facilities Disposition

In 1953, reprocessing of spent nuclear fuel began at the INTEC, resulting in the generation of liquid high-level waste and sodium-bearing liquid waste. Those wastes were placed into interim storage in underground tanks at the INTEC Tank Farm. Treatment of those wastes began in 1963 through a process called calcining. The resultant waste form, known as calcine, was placed in storage in stainless steel bins at the Calcine Solids Storage Facility. Processing of spent nuclear fuel was curtailed in 1992. The INEEL completed calcining of all nonsodium-bearing liquid high-level waste on February 20, 1998, four months ahead of the June 30, 1998, Idaho Settlement Agreement milestone. Calcining of remaining sodium-bearing liquid waste began immediately following completion of nonsodium liquid waste treatment, more than three years ahead of the Settlement Agreement milestone. Per that Agreement, all such waste is required to be calcined by the end of the year 2012.

The calciner was placed on standby in 2000 while DOE determines whether to upgrade and permit the facility to current standards or develop a new method of treating the remaining sodium-bearing liquid waste. Treatment alternatives for the remaining sodium-bearing liquid and calcined wastes were evaluated in the Idaho High-Level Waste and Facilities Disposition Environmental Impact Statement (see Chapter 2, National Environmental Policy Act). The remaining 3.7 million L (one million gal) of sodium-bearing liquid waste is stored in up to eleven 1.14 million L (300,000 gal) underground tanks in the Tank Farm. Six of these tank farm tanks

have been emptied, cleaned, and removed from service in preparation of final closure. The other five tank farm tanks remain in service to store the sodium-bearing waste. Decisions regarding the treatment technology for the sodium-bearing waste are expected with the award of the new Idaho Cleanup Project contract in 2005. In addition, work continues in 2004 and 2005 to investigate technologies for efficient retrieval of the existing high-level waste calcine from the calcine storage facilities. In the future, the high-level waste calcine will be retrieved, treated as necessary, and packaged for disposal at the national high-level waste repository.

Low-level and Mixed Radioactive Waste

Under the Accelerated Cleanup initiative, INEEL embarked on an accelerated schedule to reduce a 2250 m^3 (2943 yd^3) backlog of mixed low-level waste. In 2003, INEEL treated and disposed of more than 900 m^3 (1177 yd^3) of mixed low-level waste. By calendar year-end, more than half the backlog was removed from Idaho with just under 1150 m^3 (1504 yd^3) remaining that requires treatment and disposal. The remaining backlog inventory will be eliminated in 2004, two years ahead of schedule under an accelerated cleanup plan. Approximately 4000 m^3 (5232 yd^3) of legacy and newly generated low-level waste were disposed at the SDA in 2003.

Transuranic Waste

The Settlement Agreement requires that the INEEL must ship at least 6000 m^3 (7848 yd^3) of TRU waste out of Idaho between January 1, 2003 and December 31, 2005. In 2003, INEEL shipped a total of 384 m^3 (502 yd^3) of TRU waste out of Idaho.

Waste Minimization/Pollution Prevention

The mission of the INEEL Pollution Prevention Program is to reduce the generation and release of wastes and pollutants by implementing cost-effective pollution prevention techniques, practices, and policies. Pollution prevention is also required by various federal statutes, including but not limited to, the Pollution Prevention Act; RCRA; Executive Order 12856; and Executive Order 12873 (Federal Acquisition, Recycling, and Waste Prevention).

It is the policy of the INEEL to incorporate pollution prevention into every activity. Pollution prevention is one of the key underpinnings of the INEEL Environmental Management System (see Section 3.6). It functions as an important preventive mechanism because generating less waste reduces waste management costs, compliance vulnerabilities, and the potential for releases to the environment. The INEEL is promoting the inclusion of pollution prevention into all planning activities as well as the concept that pollution prevention is integral to mission accomplishment.

Noteworthy pollution prevention accomplishments in 2003 include:

- 91,685 kg (202,130 lb) of office paper and corrugated cardboard were recycled through a local company, saving $156,000.

- An alternative in-situ process to chemically treat 45,000 gallons of low-level liquid radioactive waste containing potassium permanganate was used, saving approximately $270,000.

3.6 Environmental Management System

The INEEL M&O contractor continued to make progress on the effort initiated in 1997 to develop and implement an INEEL-wide Environmental Management System (EMS). The EMS meets the requirements of International Standards Organization (ISO) 14001, an international voluntary standard for environmental management systems. This standard is being vigorously embraced worldwide as well as within the DOE complex. An EMS provides an underlying structure to make the management of environmental activities more systematic and predictable. The EMS focuses on three core concepts: pollution prevention, environmental compliance, and continuous improvement. The primary system components are (1) environmental policy, (2) planning, (3) implementation and operation, (4) checking and corrective action, and (5) management review.

An audit and onsite readiness review conducted in 2001 by an independent ISO 14001 auditor concluded that INEEL was ready for a formal registration audit. A registration audit was conducted May 6-10, 2002, by a third-party registrar. There were no nonconformances identified during the audit and the lead auditor recommended ISO 14001 registration for INEEL facilities, which was received in June 2002. A semi-annual ISO 14001 audit conducted in November 2003, supporting maintenance of the registration, found no nonconformances with the ISO standard and generated high praise for INEEL personnel.

3.7 Other Major Environmental Issues and Activities

Decontamination, Decommissioning, and Demolition Activities

INEEL greatly stepped up efforts to reduce the EM "footprint" through accelerated decontamination, decommissioning, and demolition of EM-owned buildings and structures. This effort achieves cost and risk reduction by eliminating aging, unnecessary facilities and migrating toward consolidation of EM activities. In total, over 5574 m^2 (60,000 ft^2) of buildings and structures were demolished in 2003. Specific projects at various facilities are described below.

Test Area North - The most dramatic transformation has occurred at TAN, where more than 20 EM-owned buildings and structures were demolished in 2003. Miscellaneous laboratory, maintenance, storage, and equipment buildings as well as tanks and related structures were documented in compliance with the National Historic Preservation Act and removed according to three Memoranda of Agreement with the Idaho State Historic Preservation Office.

Power Burst Facility/Waste Reduction Operations Complex - Decontamination and dismantlement of the Waste Experimental Reduction Facility (WERF) was completed in 2003 with removal of the WERF auxiliary building, dismantlement of the North Stack Area, and dismantlement of the Highbay Room. Several other PBF structures were removed, shutdown, or abandoned in place including the PBF cooling tower.

Test Reactor Area - The Materials Test Reactor (MTR) canal high-radiation materials were cut and segregated for disposition in the MTR canal cask in support of MTR canal closure.

Security Training Facility - The reactor vessel was dismantled and removed. More than 63 tons of carbon and stainless steel were removed from the project site.

Spent Nuclear Fuel

Spent nuclear fuel (SNF) is defined as fuel that has been withdrawn from a nuclear reactor following irradiation and the constituent elements have not been separated. Upon removal, SNF contains some unused enriched uranium and radioactive fission products. Because of its radioactivity (primarily from gamma rays), it must be properly shielded. A large amount of DOE's spent nuclear fuel is from national defense and other programmatic missions. Most of the fuel stored at the INEEL is at the INTEC.

For several years, spent nuclear fuel was reprocessed so recovered fissile material could be reused. However, the need for fuel grade uranium and plutonium decreased. A 1992 decision to stop reprocessing left a large quantity of spent nuclear fuel in storage.

DOE's spent nuclear fuel is stored in both wet and dry storage. Dry storage is preferred because it reduces concerns about corrosion and is less expensive to monitor. An effort is underway to put spent nuclear fuel in temporary dry storage so that it can be quickly readied for transport once a repository is completed. The INEEL's goal is to begin shipping spent nuclear fuel to a national repository by September 30, 2015. The Idaho Settlement Agreement, and a similar agreement with the state of Colorado, requires that all spent nuclear fuel must be out of Idaho by January 1, 2035. A significant accomplishment was achieved in 2003 when the last of the INEEL's aging wet storage basins at the PBF and TAN were emptied of spent nuclear fuel.

Spent nuclear fuel transfers and storage facilities are described below.

Fluorinel Dissolution Process and Fuel Storage Facility - This INTEC facility, also called FAST, is divided into two parts: a spent fuel storage area and the Fluorinel Dissolution Facility. This facility went operational in 1983. The storage area consists of six storage pools where spent nuclear fuel is stored under about 11 million L (3 million gal) of water, which provides protective shielding and cooling. Fuel formerly managed in the three storage pools at CPP-603 has been transferred to the newer underwater storage pools at FAST or to dry storage. Eventually, all spent nuclear fuel will be removed from underwater storage pools and placed in a dry storage system in preparation for shipment to a repository. In 2003, the Advanced Test Reactor dispatched 21 shipments of spent nuclear fuel to FAST for storage.

Irradiated Fuel Storage Facility - The Irradiated Fuel Storage Facility (IFSF), the dry side of the Wet & Dry Fuel Storage Facility (CPP-603), provides dry storage for spent nuclear fuel. The original facility (the wet side - basins) went operational in 1953. The IFSF was added later and went operational in 1973. The facility has 636 storage positions and is over half full. The majority of the spent nuclear fuel stored at the IFSF came from the Fort St. Vrain commercial reactor in Colorado. In the largest single fuel shipment of spent nuclear fuel ever made in the U.S., the DOE West Valley site in New York shipped 125 assemblies in two casks to the INEEL in July 2003 for storage at IFSF. INEEL also received fuel shipments from DOE Oak Ridge, General Atomics, Cornell University, and Japan. In addition, all remaining MTR and PBF fuel was shipped to the IFSF for interim storage.

TAN Hot Shop/Manufacturing & Assembly Facility - TAN Hot Shop/Manufacturing & Assembly Facility, TAN-607, contains a hot shop (for handling spent nuclear fuel), and a spent fuel storage basin. TAN-607 went operational in 1955. Loss-of-Fluid Test, commercial, and test reactor SNF (totaling 3.6891 metric tons - heavy metal [MTHM] [4.06 tons]) was transferred from wet storage in the basin, dried, placed within casks, and the casks relocated to the storage pad, TAN-791, in 2002. A new pad, CPP-2707, is under construction at INTEC to which the casks will be transferred in 2004. All 62 spent nuclear fuel storage racks, the coffins, the transfer cart adapter, and miscellaneous equipment were removed from the TAN-607 storage basin in 2003. The basin water will be removed and disposed at the TRA evaporation pond.

TMI-2 Independent Spent Fuel Storage Installation - The Independent Spent Fuel Storage Installation (ISFSI), CPP-1774, is an NRC-licensed dry storage area for spent fuel and debris from the Three Mile Island reactor accident. Fuel and debris were transferred to the TAN for examination, study, and storage following the accident. After examination the spent fuel and debris were transferred to the ISFSI. The ISFSI provides safe, environmentally secure, aboveground storage for the spent fuel and debris, which is kept in metal casks inside concrete vaults.

Power Burst Facility - The PBF, built in 1970, supported DOE and NRC studies of reactor fuel during normal and off-normal operating conditions. The PBF operated as a one-of-a-kind facility, with the ability to subject fuel samples to extraordinary power surges in milliseconds, causing the fuel to fail in an isolated, contained system. The NRC then used that information in developing safe operating limits for the commercial nuclear power industry. In 1985, the PBF reactor was placed on stand-by status and was eventually placed in shutdown status in 1998. PBF fuels were transferred to the IFSF in 2003.

Peach Bottom Fuel Storage Facility - The Peach Bottom Fuel Storage Facility, CPP-749, consists of below ground vaults for the dry storage of spent nuclear fuel. Located on approximately five paved acres, this facility houses 193 underground vaults of various sizes for the dry storage of nuclear fuel rods. The vaults are generally constructed of carbon steel tubes with some of them containing concrete plugs. All of the tubes are totally below grade and are accessed from the top using equipment specifically designed for this use. This facility stores Peach Bottom fuel as well as other unirradiated fuels.

Fort Saint Vrain Independent Spent Fuel Storage Installation - The DOE manages this offsite NRC-licensed dry storage facility containing about two-thirds of the spent nuclear fuel generated at the Fort Saint Vrain reactor in Colorado.

Environmental Oversight and Monitoring Agreement

The 2000 Environmental Oversight and Monitoring Agreement between DOE-ID, DOE Naval Reactors, Idaho Branch Office, and the state of Idaho maintains the State's program of independent oversight and monitoring established under the first agreement in 1990 that created the state of Idaho INEEL Oversight Program. The main objectives of the current five-year agreement are to

- Assess the potential impacts of DOE activities in Idaho;
- Assure citizens of Idaho that all DOE activities in Idaho are protective of the health and safety of Idahoans and the environment; and
- Communicate findings to the citizens of Idaho in a manner that provides them the opportunity to evaluate these potential impacts.

The INEEL Oversight Program's main activities include environmental surveillance, radiological emergency planning and response, impact assessment, and public information. More information can be found on the Oversight Program website at http://www.oversight.state.id.us/.

Citizens Advisory Board

The INEEL Citizens Advisory Board, one of the Environmental Management Site-Specific Advisory Boards, was formed in March 1994. Its charter is to provide input and recommendations on DOE Environmental Management's strategic decisions that impact future use, risk management, economic development, and budget prioritization activities.

The Citizens Advisory Board has produced over 100 recommendations during its tenure. Currently, the Board is working on the following issues, in addition to numerous others:

- End State Vision for the INEEL;
- Long-Term Stewardship Implementation Plan for the INEEL;
- Engineering Evaluation and Costs Analyses for CPP-603, CPP-637 and other facilities;
- Environmental Assessments of the ETR and MTR;
- Impacts of the New Mission on INEEL Cleanup;
- Cleanup of Pit 4; and
- Waste streams with no current disposition path.

REFERENCES

63 FR 189, 1998, "Final Modification of the National Pollutant Discharge Elimination System Storm Water Multi-Sector General Permit for Industrial Activities," *Federal Register*, U.S. Environmental Protection Agency, September 30, p. 52430.

Bauer, W., 2003, DOE-ID, to S. S. Crawford, BBWI "Actions in Regards to Environmental Protection Agency of the United States," CCN 46917, December 15, 2003.

Ryan, M., 2003, EPA Region 10, to A. E. Gross, DOE-ID, "Storm Water Compliance at the INEEL," CCN 46063, October 27, 2003.

Twining, B.V., Rattray, G., and Campbell, L.J., 2003, *Radiochemical and Chemical Constituents in Water from Selected Wells and Springs from the Southern Boundary of the Idaho National Engineering and Environmental Laboratory to the Hagarman Area, Idaho, 2001*, U.S. Geological Survey Open-File Report 01-168, DOE/ID-22185, 32 p.

U.S. Department of Energy Order 5400.1, 1993 "General Environmental Protection," U.S. Department of Energy, January.

U.S. Department of Energy-Idaho Operations Office, 2003, *INEEL Long-Term Stewardship Strategic Plan*, DOE/ID-11008.

U.S. Department of Energy-Idaho Operations Office, 1993a, *Idaho National Engineering Laboratory Groundwater Monitoring Plan*, DOE/ID-10441.

U.S. Department of Energy-Idaho Operations Office, 1993b, *Idaho National Engineering Laboratory Groundwater Protection Management Plan*, DOE/ID-10274, March.

U.S. Department of Energy-Idaho Operations Office, 1991, *Idaho National Engineering Laboratory Historical Dose Evaluation, Appendix E, Environmental Surveillance*, DOE/ID-12119, Vol. 2, August.

U.S. Geological Survey, 1998, http://water.usgs.gov/pubs/FS/FS-130-97/, April.